Plant Document Analysis

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ENGINEERING SPECIFICATION ANALYSIS

Focus Area: Nozzle Load Analysis

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Accepted Specifications for Evaluation of Nozzle Load Analysis

- Appendix P — Mandatory nozzle design/loading table specifying design external loads to be used as minimum requirements for shell■mounted nozzles. Table entries (loadings apply at the nozzle■to■shell junction):

- Nozzle Size 2" and below: loads are considered negligible.

- Nozzle Size 3": Radial Load = 1000 N; Circumferential Moment = 200 Nm; Longitudinal Moment = 200 Nm.

- Nozzle Size 4": Radial Load = 1500 N; Circumferential Moment = 300 Nm; Longitudinal Moment = 300 Nm.

- Nozzle Size 6": Radial Load = 2500 N; Circumferential Moment = 700 Nm; Longitudinal Moment = 700 Nm.

- Nozzle Size 8": Radial Load = 4000 N; Circumferential Moment = 1500 Nm; Longitudinal Moment = 1500 Nm.

- Nozzle Size 10": Radial Load = 5000 N; Circumferential Moment = 2500 Nm; Longitudinal Moment = 2500 Nm.

- Nozzle Size 12": Radial Load = 7000 N; Circumferential Moment = 4000 Nm; Longitudinal Moment = 4000 Nm.

- Nozzle Size 14": Radial Load = 9000 N; Circumferential Moment = 6000 Nm; Longitudinal Moment = 6000 Nm.

- Nozzle Size 16": Radial Load = 11000 N; Circumferential Moment = 8000 Nm; Longitudinal Moment = 8000 Nm.

- Nozzle Size 18": Radial Load = 13000 N; Circumferential Moment = 10000 Nm; Longitudinal Moment = 10000 Nm.

- Nozzle Size 20": Radial Load = 15000 N; Circumferential Moment = 13000 Nm; Longitudinal Moment = 13000 Nm.

- Nozzle Size 24": Radial Load = 20000 N; Circumferential Moment = 18000 Nm; Longitudinal Moment = 18000 Nm.

- Note: “Loadings for nozzles greater than 24 inch NB are to be agreed between CONTRACTOR and CONSTRUCTION MANAGER.”

- Appendix P — Clause: CONTRACTOR shall provide calculations justifying acceptability of specified external nozzle and support pad loading; CONTRACTOR to confirm acceptability or advise maximum acceptable loading for the tank design.

- Vendor Data Requirements (Clause 12.2, During Manufacturing & site erection): Vendor deliverable explicitly includes “Nozzle load Analysis.”

- 5.7.6.1.a Addition: Nozzle flanges above 24" NB (except manways) shall comply with ANSI B16.47 Series B Type (flange standard referenced for large nozzles/flanges).

- 5.8.2 Addition: Reinforcement or bearing plates shall be added to the tank bottom under all concentrated loads — applicable where concentrated nozzle / equipment loads transmit to bottom.

- 5.12.6 Addition: Anchor chairs shall be located to clear nozzles, manways, vertical shell seams and exterior shell accessories — explicit coordination requirement for anchor/bolt placement relative to nozzle locations.

- Appendix B / B.7 and B.8 (New Paragraphs): CONTRACTOR to specify all anchor bolt loadings and concrete foundation to be designed to hold down anchor load — relevant where nozzle loads may affect anchorage design.

- Appendix P — statement that “Loadings shown in the above table apply at the nozzle to shell junction.” (explicit load application location)

Measurements Provided in Document

- The nozzle loading table numeric values (radial loads and circumferential & longitudinal moments) for nozzle sizes 3", 4", 6", 8", 10", 12", 14", 16", 18", 20", 24" as listed above (see Accepted Specifications for the full numeric list).

- Nozzle sizes 2" and below: explicitly stated as “loads are considered negligible.”

- Minimum anchor bolt size: “Minimum size of anchor bolt shall be M33” (Appendix B / F references).

- Corrosion allowance for anchor bolts: “Corrosion allowance is to be a minimum of 6 mm (0.25 inch)” (5.12.5 Addition).

- Minimum clearance related to under■bottom fittings: “minimum clearance of 305 mm (12 inch) plus the width of annular plate” between shell and edge of sump or fitting (5.8.7 Addition) — relevant if nozzle/under■bottom connection loads are transmitted into sump area.

- Projection requirement for roof/shell openings: openings (except specified exceptions) shall provide a projection below liquid surface (multiple clauses) and some drain projections: internal floating roof drains to extend into product a minimum of 100 mm (H.4.1.10). (These are dimensional requirements for openings that may be associated with nozzle connections.)

Inputs and Additional Requirements from Client

Explicit inputs provided in the document (as stated):

- OWNER will provide basic configuration, service data, design requirements and all other applicable loads; these shall be specified on the tank data sheet and in this specification.

- Vendor deliverable requirement: “Nozzle load Analysis” (vendor must submit analysis as part of Vendor Data Requirements).

- CONTRACTOR responsibility to confirm acceptability of specified nozzle/support pad loading or advise maximum acceptable loading for the tank design (Appendix P).

- Loadings for nozzles >24" NB must be agreed between CONTRACTOR and CONSTRUCTION MANAGER.

- Flange standard for nozzles above 24" NB: ANSI B16.47 Series B Type (buyer requirement).

Additional information/clarifications explicitly requested or required by the document but not provided in the file (items the Contractor/Vendor must obtain or that must be shown on Tank Data Sheet):

- Tank data sheet values (explicitly stated as to be provided on tank data sheet): nozzle sizes, nozzle locations (circumferential and elevation), nozzle orientations, and any specified external piping/support loads to be applied (document requires these to be on tank data sheet but they are not present in the text provided).

- Confirmed applicable design code edition and addenda for nozzle load acceptance (specification refers to API 650 latest at order date; vendor must use edition effective on order).

- Any nozzle loads greater than the table values if piping layout requires higher loads (document allows higher loads but requires CONTRACTOR to confirm acceptability or advise maximum acceptable values).

- Support conditions for connected piping (rigid/ flexible, presence/location of pipe supports/anchors) and any dynamic or thermal load components — required inputs for complete nozzle load analysis but not provided in the document.

- Material properties and plate thicknesses at nozzle location (to assess local acceptability and need for reinforcement) — document references material grades but not tank■specific properties.

- Details of pad/reinforcement geometry and welding details at nozzle■to■shell junction (contractor to provide calculations demonstrating acceptability).

- Seismic, wind and other site■specific loads to be combined with nozzle loads per applicable code (document references IS 1893, IS 875 and project BEDD but does not give specific combination rules or tank data values).

- Location and magnitude of concentrated loads near nozzle areas (e.g., heating coils, mixers) if they interact with nozzle loads — document requires reinforcement under concentrated loads but does not give specifics.

- For anchor/anchor■bolt interaction: exact anchor bolt layout, bolt projection/threading requirements and tolerances to be furnished by CONTRACTOR (document requires contractor to furnish recommendations but no values are given in supplied text).

- Any specified maximum allowable shell stresses or allowable deformations for assessing nozzle loads (not specified in the provided document excerpt).

Notes on scope and constraints applied in this analysis

- Extraction strictly limited to items explicitly stated in the supplied specification document and directly relevant to “Nozzle Load Analysis.”

- Industry standard sources referenced implicitly by the document itself: API 650 (and its Appendices P, B, etc.), ANSI B16.47 (for large flanges), IS 875 (wind), IS 1893 (seismic). The document requires vendor calculations to be consistent with those codes; the above Accepted Specifications are the nozzle■related items that the document mandates.

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END OF ANALYSIS

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